Abstract Submitted
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Towards a machine learning method for simulating turbulence-shockwave interactions[1] BEN STEVENS, TIM COLONIUS, Caltech — In recent years, machine learning has been used to create data-driven solutions to problems for which an algorithmic solution is intractable, as well as fine tuning existing algorithms. This research applies machine learning to the development of an improved finite-volume method for turbulence-shockwave interactions. Shock capturing methods make use of complicated nonlinear functions that are not guaranteed to be optimal. Because data can be used to learn complicated nonlinear relationships, we train a neural network to improve the results of WENO5. We also post-process the outputs of the neural network to guarantee that the method is consistent. The training data is generated using integrable functions that represent the waveforms we would expect to see while simulating a PDE, which gives us an exact mapping between cell averages and interpolated values. We demonstrate our method on linear advection of a discontinuous function, the inviscid Burgers equation, and the 1D Euler equations. Specifically, we examine the Shu-Osher problem, a toy problem for turbulence-shockwave interactions. We also show preliminary results for dynamically trained models.

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